

# Arizona Geological Society presents

A Revised Timing of the Mazatzal Orogeny in its Type Area:

New Age Constraints From Detrital Zircon

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Tuesday, 4 Jan. 2022 | 6:30 p.m. (MST)

**ZOOM:** <https://arizona.zoom.us/j/83569941022>

Passcode: AGS-2022

ZOOM window opens at 6:15 p.m.



Recently published detrital zircon data and new regional correlations across Tonto Basin of central Arizona support revising the timing of the Mazatzal orogeny, in its type area, to ca. 1.485-1.45 Ga, contemporaneous with the Picuris orogeny of New Mexico. Widely accepted as a ca. 1650 Ma event, NW-directed contraction attributed to the ca. 1.65 Ga Mazatzal orogeny, extended, temporally and spatially, to 1.58 Ga per Duebendorfer et al. (2015), our new timing constraints require a paradigm shift about this important phase of continental growth. The new timing does not affect well documented deformation ca. 1.7-1.65 Ga across southwest Laurentia.

The 2-km-thick Mazatzal Group (MG) in the northern Mazatzal Mountains is deformed by northwest-directed folding and thrusting, recording 35-40% shortening. Deformation in this area has long been interpreted as the type locality for the Paleoproterozoic Mazatzal orogeny. The MG includes the basal Deadman quartzite, Maverick shale, and Mazatzal Peak quartzite. The upper most MG is conformably overlain by erosional remnants of the Hopi Springs Shale. The basal Hopi Springs Shale has a maximum depositional age of 1.57 Ga and is folded beneath the Barnhardt Thrust, long viewed as one of

characteristic structures of the Mazatzal orogeny. A correlative metapelite within the core of the Four Peaks quartzite synform in the southern Mazatzal Mountains yielded a maximum depositional age of 1.58 Ga. The lower quartzite at Four Peaks was deposited on a ca. 1.657 Ga rhyolitic ashflow. The MG also correlates to the post-1.657 Ga White Ledge Formation (WLF) in the upper Salt River Canyon. The WLF is conformably overlain by the Yankee Joe Group (YJG), which yields a maximum depositional age of ca. 1.47 Ga. Remnants of this new Early Mesoproterozoic basin are found in outcrops scattered across Arizona and New Mexico.

Following, and possibly during, top to the northwest contraction the WLF and YJG were intruded

by the 1.444 Ga Ruin Granite. Subsequent uplift and erosion followed with deposition of the Apache Group over a high-relief, angular unconformity. Our revised timing for the Mazatzal orogeny is contemporaneous with the Picuris orogeny. Across Tonto Basin, stratigraphic evidence suggest little, if any, tectonism occurred between 1.66 – 1.47 Ga although ash deposits in intrusions in the McDowell Mountains, dated between 1.6 – 1.5 Ga, support some level of igneous activity across the region.

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*The Upper Salt River Canyon*



## Bio of Michael Doe, Ph.D., Presenter

Born and raised in Tucson, Mike attended the U of A before transferring to NAU to complete his BS and MS in Geology. Over 30 years, Mike has worked as a structural geologist and regional tectonics specialist for mostly petroleum related projects, international and domestic. He worked for Mobil, Unocal, Schlumberger, and Midland Valley Exploration. In 2007, Mike decided to return to school for his PhD, completing his dissertation titled "Reassessment of Paleo- and Mesoproterozoic basin sediments of Arizona: Implications for tectonic growth of southern Laurentia and Global tectonic configurations" at Colorado School of Mines in 2014. Mike's interests in Proterozoic geology stemmed from his senior and Masters Theses that involved mapping in the northern Mazatzal Mountains. His PhD expanded, in part, on his MS work to focus on resolving the timing and character of the apparent coaxial Yavapai and Mazatzal orogenies, and basin evolution across the Arizona Proterozoic transect. Mike and his wife, GERALYN, currently split their time between Denver and Tucson.